**OBJECTIVE**

Develop a high voltage (> 15kV) silicon carbide (SiC) power module to aid in the emergence of smarter, seamless powered grids.

**APPLICATIONS**

- Energy storage systems
- Solid-state transformers
- Naval power distribution
- Electric locomotives
- Solid-state circuit breakers

**ADVANTAGES**

- Reduce size/complexity compared to multi-level system
- Eliminate cooling systems
- Increase efficiency and power density

**BACKGROUND**

- High switching frequency
- Solid state circuits
- Increase efficiency and power density

**RESULTS**

- Thermal, Electrical, Mechanical Simulations
  - Baseplate Displacement
  - Dispersed Power (W)

- Power Module Assembly Development
  - Low void power substrate attach (< 5 % voids)
  - Low void Ag sinter die attach
  - Low leakage current up to 22.5 kV

**APPROACH**

Design a high performance power module that will take full advantage of the superior properties of high voltage SiC devices.

**ADVANTAGES OF SiC DEVICES**

- High breakdown voltage
- High thermal conductivity
- High switching frequency
- High temperature operation

**POWER MODULE FEATURES**

- Device neutral
- Low profile
- Reduced volume/weight
- High temperature capable (200 °C)

**FUTURE WORK**

- Power Module Static Testing
  - Gate leakage
  - Reverse leakage
  - On-state curves
  - On resistance
  - Transconductance

- Power Module Dynamic Testing
  - Turn-on and -off delay time
  - Rise and fall time
  - Turn-on and -off over voltage
  - Switching loss

APEI, Inc. would like to thank Dr. Imre Gyuk of the DOE Energy Storage Systems Program and Dr. Stan Atcitty for his technical contributions.